pedition, as described by Major Jephson. The most important feature was undoubtedly the small collection brought away "for Emin Pasha to classify" by Lieut. Stairs from "a high altitude on the slopes of Ruwenzori, or the Mountains of the Moon."

Last year Mr. Scott Elliot, an accomplished botanist and experienced African traveller, submitted to the Government Grant Committee of the Royal Society a scheme for an extended plan of botanical exploration in Central Africa. On the advice of the Board for Botany, Mr. Scott Elliot undertook the investigation of Ruwenzori, and through the kind aid of Sir John Kirk, such official facilities as were possible were obtained on his behalf.

Mr. Scott Elliot, not without many difficulties, has now reached his destination. The following letter, which is communicated to NATURE at his request, raises a high expectation that he will succeed in thoroughly investigating the flora of this interesting region. It is a matter of sincere hope that his health will be spared for the task. Unfortunately the time is far distant when, as prophesied by Mr. Stanley, the "tender-hearted botanist" may be "conveyed from point to point without danger to his valuable life." The honour is all the greater to a man of by no means robust physique, who in the pure interests of science is willing to take his life in his hand in the prosecution of such a task.

W. T. THISELTON-DYER.

Royal Gardens, Kew, September 25.

Ruwenzori, May 2, 1894.

I arrived here on April 1, but have unfortunately been able to do very little, as I have had severe fever. I may not have another opportunity of writing for a long time, so send this now. My route has been through Kavirondo, Usoga, and Uganda to Buddu, through Buddu to Karagwe, and thence diagonally across Ankobe to Toru. I find Uganda, Buddu, and Toru to consist of a plateau apparently gneiss and granite, about 4000–4500 feet high in most parts, but about this part of Toru 5000 or even 5300 feet. The whole of this plateau is cut up into innumerable swampy rivers, due to the comparative slow gradient of these rivers (the Victorian Nyanza being only 3850 feet). In Karagwe and Ankobe this plateau is covered by a series of folded schists and shale which extend with one break from Kitangule to within eight miles of the Albert Edward Nyanza, where the granite plateau is reached again. These schists are at 80°–90° dip, and strike usually 20°–30° east of north. A curious little chain of small volcanic craters, running east and west nearly, appears in the midst of the granite at Vijongo (on Lugard's map), that is, at the base of Ruwenzori, but I have not been able as yet to see much of the geology of Ruwenzori itself. The flora over the whole of this country up to 6000 feet is identical, and even at 6000 feet there are but few new species. It seems probable to me that this flora extends right down to the Zambesi. I have been able to get a fair number of species representing it, but in what condition they will reach England remains to be seen. Of trees there are very few. A tree *Euphorbia* and an *Erythrina* are the commonest. The most objectionable is a bamboo-like grass, often twenty feet high, which makes travelling most annoying. Another conspicuous plant is an Acanth with handsome red spikes of flowers and very large prickly leaves. There are two or three Helichrysums, numerous Commelinas and twining *Leguminosæ*, and, strangely enough, a *Rubus*, a buttercup, and three *Umbelliferæ*. I find also the same beetles, butterflies, and dragonflies everywhere.

The country as a whole seems very fertile, and the population is probably one-hundredth part of what it might be. The swamp rivers alluded to are probably the most extensive natural rice-fields in the world; but rice has only been grown in a very half-hearted manner. The banana supplies all the wants of the people. Tobacco could also be grown anywhere, and, as far as one can judge from the native plant, a very good kind could be produced. Coffee could also be grown, and cotton, and, in fact, most of the common tropical plants. Kasamaga, the king here, tells me he wants Europeans to settle here and teach his people; and a young fellow who is disposed to rough it, and fond of sport, might do very well here at Ruwenzori. He could support himself the first few years by ivory (shooting and trading), and by the time his plantation came into bearing there ought surely to be communication with the coast. A curious fact in natural history has come about here. Kabbarega has eaten up all the cattle in the country. There is scarcely a fowl left, and in consequence lions and leopards have taken wholesale to man-hunting. They have completely changed their manner of hunting in accordance with this. Usually speaking they are continually roaring on the trail, but here neither ever utters a sound, and though I have had two men injured, and been within a hundred yards of another man who was carried off, I heard nothing.

Mapping is very difficult here; the compass shows the most extraordinary variations, and the rivers are almost impossible to trace, even from a great height, as where I am now.

I have not been able yet to get at the higher flora. One curious fact is that the woods on Ruwenzori very closely follow the ordinary morning clouds and mists: these are usually at the same line every morning, and mount to the top towards evening. This line of wood or cloud is not, however, horizontal, but is highest at the main mass, and slopes gradually as the mountain chain sinks in height.

(Signed) G. F. SCOTT ELLIOT.

THE PHYSIOLOGICAL ACTION OF THE PARAFFIN NITRITES.[1]

THE valuable investigations described in this communication to the Royal Society have been made to determine more exactly the mode of action of paraffinic nitrites, and the part which the nitroxyl group NO_2 plays in their physiological action, and also to throw light on the effect of variations in their molecular constitution. For these objects a series of careful observations have been made as to the action of ten of the fatty nitrites on (1) blood pressure, (2) pulse frequency, (3) respiration, (4) striated muscle tissue.

The compounds selected for examination included the nitrites of methyl and ethyl, the primary and secondary propyl nitrites, the primary, secondary, and tertiary butyl nitrites, and three amyl nitrites (α and β isoprimary, and tertiary amyl nitrite). By this selection it has been possible to compare the action of a series of substances containing an atom of NO_2 united respectively to CH_3, C_2H_5, C_3H_7, C_4H_9, and C_5H_{11}, and thus to determine the modifying influence which these radicals exert on the action of the NO_2 group. It has also been possible to ascertain the effect produced by a modification of arrangement of the molecules in nitrites having the same composition as, *e.g.* in primary and secondary propyl nitrite,

$$CH_3CH_2CH_2NO_2, \text{ and } (CH_3)_2CHNO_2$$

It has long been known that the fatty nitrites lower blood pressure, but opinions have differed as to their mode of action, Filehne considering that this lowering is caused by a paretic influence on the vasa motor centres, whilst Brunton looks upon it as due to a direct effect on the vessels themselves. Cash and Dunstan are led by their experiments to range themselves on the side of

---

[1] *Phil. Trans.* vol. clxxxiv. (1893), B, pp. 505–639. A paper by Dr. J. Theodore Cash F.R.S., and Prof. Wyndham R. Dunstan.

© 1894 Nature Publishing Group

Brunton, for they find that if the presence of amyl nitrite is confined to the vessels of the brain alone, a fall of pressure does not take place, but it does occur if blood containing the nitrite circulates in the peripheral vessels of the body, even though the access of any nitrite to the brain is prevented. They likewise find that nitrites are capable of influencing vessels in the area supplied by the splanchnic nerves after section of these nerves—another proof that the action of the nitrites is peripheral.

The part which the group NO_2 plays in its fatty compounds they have sought to determine by ascertaining quantitatively the comparative amount of influence which each nitrite exerts on blood pressure, pulse frequency, and respiration, when introduced into the circulation of anæsthesised cats, by inhalation or by injection into the arterial or venous system, and also by ascertaining the comparative effect of paraffinic nitrites on the pulse frequency in man.

The quantitative method is doubtless open to some fallacies, but from the extreme care which has manifestly been taken in conducting the experiments, and the laborious manner in which they have been repeated, it seems certain that the results are in the main reliable. With regard to the influence of the nitrites in accelerating the beat of the heart, it is shown that physiological activity increases with molecular weight; amyl nitrite is more powerful than butyl nitrite, butyl than propyl, and so on, methyl being the weakest of all.

The order in which the paraffinic nitrites reduce blood pressure in amount is somewhat, though not quite the same, as that in which they accelerate the pulse, but important exceptions occur, especially in the case of methyl nitrite, which occupies a higher position as a pressure reducing agent than it does as a pulse accelerator. On the other hand, as regards duration of subnormal pressure, the order is quite altered, the nitrites which depress blood pressure to the greatest extent acting for the most part for the shortest time.

The authors have also endeavoured to determine the comparative influence of the various nitrites on striated muscle by exposing the excised gastrocnemius and triceps muscles of frogs to equal quantities of their vapours, and recording the extent and duration of contraction produced with or without electric stimulation. This method is open to the objection that hydrolysis of nitrite vapours occurs very rapidly in the presence of aqueous vapour, nitrous acid being produced. Now, muscle tissue is very susceptible to the influence of acids, and it seems by no means certain that the contractions recorded may not have been in part, at least, due to the acid evolved from the nitrite decomposition. With one exception (propyl nitrite) it was noted that the nitrites with low molecular weight were the least powerful in causing muscle contraction, but they acted for the longest time.

Concerning the effects which constitution of the molecule apart from composition has, it was noted throughout that when the effects of primary, secondary, and tertiary nitrites having the same composition were compared, the secondary nitrite was found to have a more powerful influence on pulse acceleration, blood pressure, and muscular contraction than the primary, and the tertiary than the secondary.

The fact that the acceleration of the heart caused by the various fatty nitrites increases with their molecular weight indicates, as the authors justly assume, that the quickening action on the pulse cannot be simply conditioned by the amount of nitroxyl in their molecules, even though it may be true that the nitroxyl group itself quickens the heart's action, for the molecule of methyl nitrite, which is the least effective, contains the largest amount of NO_2, whilst that of amyl nitrite, which most powerfully accelerates the heart's action, contains less NO_2 than any of the other nitrites examined. A similar conclusion is drawn with regard to the influence of the nitroxyl element in causing lowered blood pressure. It is further pointed out, that the preponderance of the hydrocarbon molecules in the higher nitrites is not necessarily the cause of their increased influence in quickening the pulse and lowering pressure. There are other possible causes. After considering some of these the authors express their opinion that the more marked effect of the nitrites having the largest molecules but containing the smallest amount of NO_2 is due to their decreased chemical stability. They incline apparently to the view that the actual molecules of the paraffinic nitrites do not accelerate the heart's action and lower tension, and give reasons for believing that they may actually retard the rapidity of the heart's beat. When, however, the molecule is broken up, the nitrite element becomes active, entering, perhaps, into loose combination with hæmoglobin and certain tissues before it is finally oxidised and eliminated.

The lower combinations, such as ethyl and methyl, being, as they suppose, least easily broken up, exercise least power; on the other hand, for the same reason they act for a longer time, both in lowering tension and contracting striated muscle.

To the greater instability of secondary as compared with primary, and of tertiary as compared with secondary nitrites, they attribute their respectively greater power, rather than to the fact that in the secondary and tertiary compounds one and two methyl groups are respectively attached to the carbon combination of the nitroxyl group. Much remains to be done before the inferences drawn from the elaborate investigations, the results of which have been presented to the Royal Society, can be regarded as definitely proved; but this paper adds, in an important manner, not only to our knowledge of the action of the nitrites, but to our comprehension of the manner in which chemical agents influence the tissues, and become of therapeutic value.

THE LATE PROFESSOR J. P. COOKE.

THE death of Prof. J. P. Cooke was briefly announced in these columns on September 13. The following particulars, for which we are indebted to an obituary notice in the *Tribune* of Cambridge, U.S.A., will be read with melancholy interest by the scientific world:—

Josiah Parsons Cooke was born in Boston, October 12, 1827. He was prepared in the Boston schools, and entered Harvard College in 1845, graduating three years later. In the following year he was appointed an instructor, and, in 1851, Erving professor of mineralogy and chemistry, and director of the chemical laboratory of Harvard University, a post he held until his death.

At the time Prof. Cooke entered upon his duties as head of the chemical department at Harvard, the methods of instruction were of the most rudimentary sort. Students in chemistry were required only to hear so many lectures; work in the laboratory was thought unnecessary, its place being taken by the few experiments which the lecturer saw fit to perform before his classes. Now the chemistry courses at Harvard, as at all other American colleges, consist almost entirely of laboratory work. The credit for this change is due very largely to Prof. Cooke.

Prof. Cooke was made an LL.D. by the University of Cambridge in 1882, and received the same degree from Harvard in 1889. He was a Fellow of the American Academy and a Member of the National Academy of Science. He was a popular lecturer, and delivered several courses at the Lowell Institute, one of the best-remembered being that given in 1887 on the "Necessary Limitations of Scientific Thought."

He was the author of a number of books, pamphlets, and scientific papers. Perhaps the best known of his

© 1894 Nature Publishing Group